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(56) Documents cited  
GB 2231916 A GB 2122256 A GB 1593816 A  
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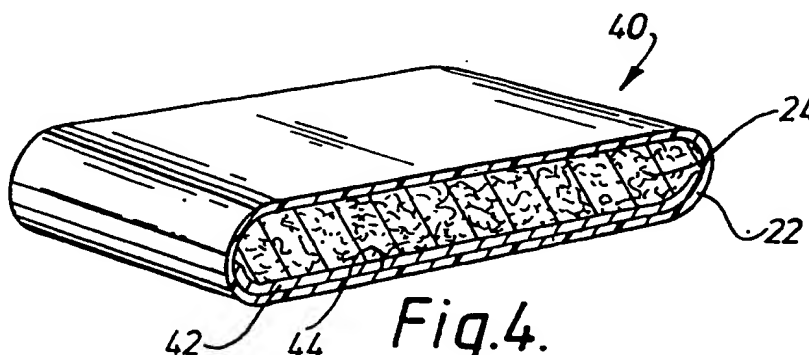
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UK CL (Edition L) F1B  
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## (54) Sound absorber insert for an exhaust silencer

(57) The insert 40 comprises a closed flexible bag-like container 22 which encloses a fibrous sound absorbent material 24. The container 22 is made from a flexible perforate meltable plastics material which is perforated to allow combustion gases and sound waves which pass through a perforated pipe around which the container is located into the sound absorbent material 24. A layer of flexible stainless steel foil 42 may abut an inner surface 44 of the outer wall of the container 22.

The insert 40 is positioned within the silencer body (4, Fig. 1) around the central perforated pipe (8) so that the foil layer 42 is disposed in the lower half of the container. The layer 42 serves to protect the lower part of the body from the corrosive effects of acidic condensate captive within the body.

Two semi-circular inserts (60, Figs. 6 and 7) may be formed of rigid stainless steel foil troughs (62) filled with sound absorbent material shrink wrapped in perforated plastics.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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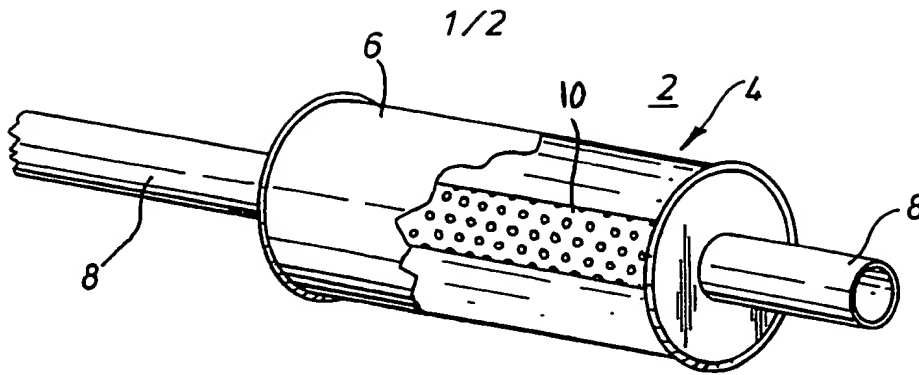


Fig. 1.

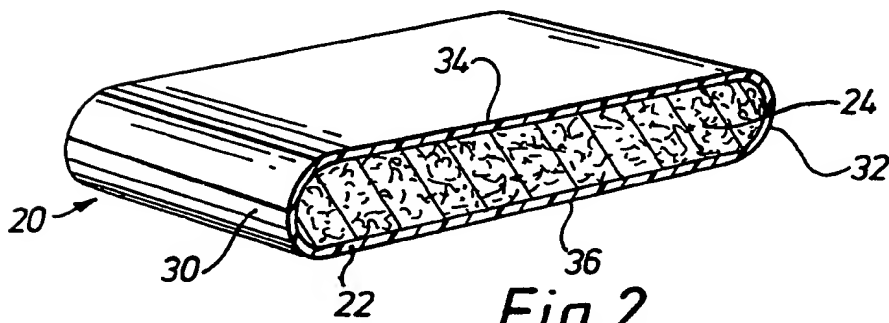


Fig. 2.

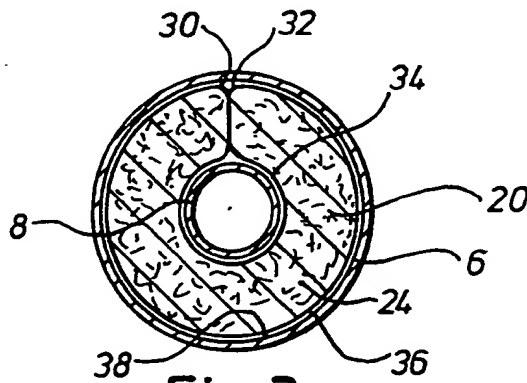


Fig. 3.

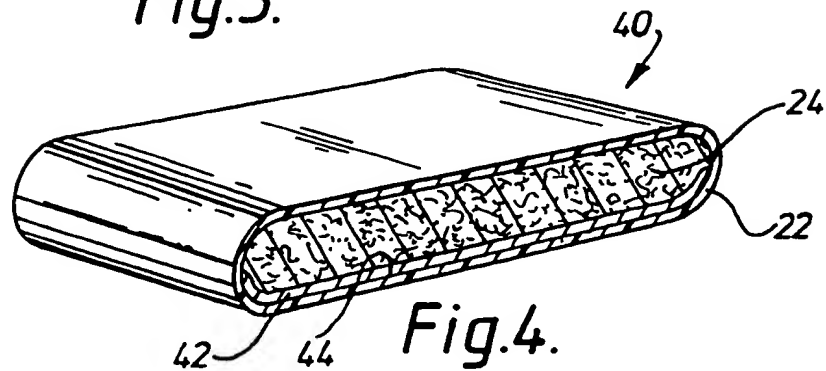


Fig. 4.

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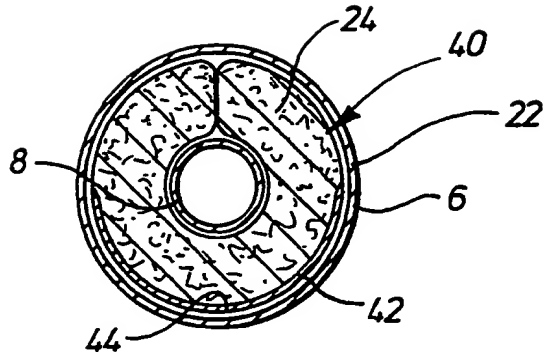


Fig. 5.

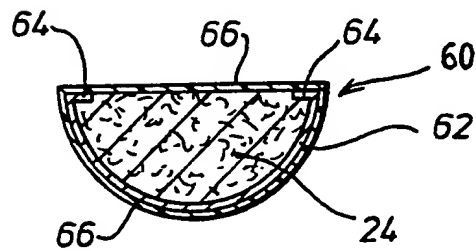


Fig. 6.

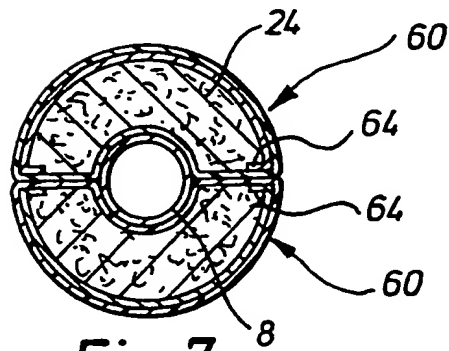


Fig. 7.

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ABSORBER

This invention relates to an absorber and particularly, although not exclusively, to a sound  
5 absorber for a silencer box of, for example, a vehicle exhaust assembly. The invention extends to a silencer box including an absorber.

A silencer box of a vehicle exhaust assembly may  
10 comprise a hollow cylindrical container through which a perforated exhaust pipe, which carries exhaust gases, passes. Sound absorbent material, for example a glass fibre and basalt fibre material, is positioned around the  
15 perforated pipe so as to fill a void between the pipe and the outer wall of the container and absorb sound waves which pass thereinto.

Since sound absorbent material in the form of glass fibre and basalt fibre is unpleasant to handle, suppliers  
20 of such fibrous materials supply the material to vehicle exhaust manufacturers in suitably shaped and sized packs which are then wrapped around the perforated pipe within the hollow cylindrical container of the silencer box.

25 The packs comprise a closed container made of plastics material within which the fibrous materials are enclosed. It will be appreciated that such packs are easy to handle and position within the cylindrical container of the silencer box.

30 In use, the plastics material is burned away as hot gases pass along the perforated exhaust pipe. However, the silencer box is not fully effective until the plastics material has burned away, since the plastics material  
35 tends to restrict absorbence of sound waves by the fibrous

materials therewithin. In view of this lack of initial effectiveness, packs of sound absorbent material as described tend not to be used in silencer boxes for replacement vehicle exhausts since, in this case,  
5 customers expect the replacement exhaust to be fully effective from the outset.

It is one object of the present invention to improve upon this situation.

10

Another problem that has been recognised concerns corrosion of the hollow cylindrical container of the silencer box. This occurs as a consequence of entrapment by the fibrous materials of acidic gas condensate. When  
15 the vehicle is not in use, the condensate gravitates to the bottom of the cylindrical container and gradually corrodes it. If the vehicle is used, in general, only for short journeys, the silencer box of the exhaust does not become hot enough to vaporise the acidic condensate and  
20 this continues to build up with detrimental effect.

It is an object of a preferred embodiment of the present invention to improve upon this situation.

25 According to the invention, there is provided a sound absorber for a silencer box, the sound absorber comprising an absorber container which contains a sound absorbent material, wherein an outer wall of the container is of perforate construction.

30

Preferably, the container is arranged, by means of its perforations, to be penetrated in use by combustion gases.

Preferably, the outer wall of the container includes a flexible outer wall part. The flexible wall part may, in use, surround, at least partially, an exhaust pipe. The flexible wall part is preferably of perforate construction. The flexible wall part is preferably perforated substantially over its entire area.

The perforations of the absorber container may have a diameter of greater than about 0.5mm. Preferably, the diameter of the perforations is greater than about 0.7mm. The perforations more preferably have a diameter of about 0.9mm. The perforations may have a diameter of less than 3.0mm; preferably of less than 2.0mm; more preferably of less than 1.5mm.

Preferably, the open area of the perforate part of the container represents at least 8% of the total area of the perforate part. More preferably, the open area of the perforate part represents at least 11% of the total area of the perforate part. The open area of the perforate part preferably exceeds 25% of the total area of the perforate part.

Preferably, substantially the entire outer wall of the absorber container is of perforate construction. Preferably, the perforations in the outer wall are of uniform size and are preferably uniformly distributed in the outer wall.

Preferably, the outer wall of the absorber container is made of a plastics material which is preferably flexible. The plastics material is preferably arranged to be meltable, in use, as the silencer within which the absorber container may be arranged reaches its working temperature. Suitable plastics materials include

polyethylene and polypropylene, polyethylene being preferred.

5 In one embodiment, the sound absorber includes an anti-corrosion layer. The anti-corrosion layer is preferably provided within the absorber container and it suitably abuts the inside surface of the outer wall of the container. The anti-corrosion layer preferably comprises a single continuous layer which occupies between 25% to 10 75% (most preferably about 50%) of the inside surface of the outer wall of the absorber container.

15 The anti-corrosion layer is preferably made of a material that resists attack by acidic substances. The anti-corrosion layer preferably comprises a metallic foil material, for example, of stainless steel or aluminium. The anti-corrosion layer may be flexible or self-supporting.

20 The invention extends to a silencer box comprising a silencer container through which an exhaust pipe passes, a sound absorber being provided around the pipe, wherein the sound absorber comprises an absorber container containing a sound absorbent material, an outer wall of 25 the absorber container being of perforate construction.

The sound absorber of the silencer box may be as described in any statement herein.

30 Preferably, the sound absorber substantially fills a void defined between the exhaust pipe and an outer wall of the silencer container. Preferably, the sound absorber is a frictional fit within the silencer container.

Preferably, a perforate part of the outer wall of the sound absorber is disposed adjacent to the exhaust pipe. The perforate part of the outer wall suitably faces the exhaust pipe. Preferably, the perforate part of the outer  
5 wall of the sound absorber extends substantially around the entire circumference of the exhaust pipe, within the silencer container.

Where the sound absorber includes an anti-corrosion  
10 layer, the anti-corrosion layer is preferably provided adjacent to the outer wall of the silencer box. Preferably, the anti-corrosion layer is provided in a lower part of the silencer box.

15 The invention extends to a sound absorber for a silencer box, the sound absorber comprising an absorber container which contains a sound absorbent material, wherein the sound absorber includes an anti-corrosion layer as described in any statement herein. The invention  
20 further extends to a silencer box including such a sound absorber.

Specific embodiments of the present invention will now be described, by way of example, with reference to the  
25 accompanying diagrammatic drawings, in which:

Figure 1 is a perspective view of a part of an exhaust assembly;

30 Figure 2 is a cross-section through an absorber;

Figure 3 is a transverse cross-section through an exhaust assembly with the absorber of Figure 2 in position;

35



Figure 4 is a cross-section through another absorber;

Figure 5 is a transverse cross-section through an  
exhaust assembly with the absorber of Figure 4 in  
5 position;

Figure 6 is a cross-section through another absorber;  
and

10 Figure 7 is a transverse cross-section through an  
exhaust assembly with the absorber of Figure 6 in  
position.

The part of an exhaust assembly 2, shown in Figure 1,  
15 comprises a silencer box 4 which itself comprises a hollow  
cylindrical steel container 6 through which a pipe 8  
passes. The pipe 8 is perforated in a region 10 within the  
container 6.

20 An absorber 20 (Figure 2) for the silencer box 4  
comprises a closed flexible bag-like container 22 which  
encloses a fibrous sound absorbent material 24. The use of  
a container 22 for the fibrous material 24 protects  
workers from the hazards of contact with the fibrous  
25 material.

The container 22 is made from a flexible perforate  
plastics material, for example, from a perforate  
polyethylene material. Other plastics materials, for  
30 example, polypropylene may be used if desired.

During construction of the exhaust assembly 2, the  
absorber 4 is positioned around the perforated region of  
the pipe 8 so as to substantially fill the void within the  
35 container 6 of the silencer box, as shown in Figure 3.

Thus, transverse edges 30, 32 of the absorber 20 abut each other; and longitudinal edges 34, 36 abut the perforated pipe 8 and the inside wall 38 of the steel container 6 respectively.

5

It should be appreciated that the absorber 8 is manufactured in a suitable size and shape so as to be a frictional fit within the container 22.

10       The flexible perforate plastics material of the container 22 is suitably perforated substantially over its entire area. The material is suitably selected so that combustion gases and/or sound waves which pass from a vehicle's engine to the silencer box 4 can penetrate the  
15       perforate plastics material immediately (before it has started to melt away) and be absorbed by the fibrous sound absorbent material within the container.

20       Thus, in contrast to prior known silencer boxes, the silencer box 4 may provide effective silencing from the outset and may, therefore, be supplied as a component of replacement vehicle exhausts.

25       A suitable plastics material which has been found to be of utility in the present application has equally spaced perforations of about 0.9mm in diameter arranged to provide at least 8% open area.

30       The sound absorbent material 24, provided within the container 22, may be of any suitable known form, for example, of glass fibre, basalt rock fibre and/or metal fibre.

35       A further embodiment which is designed to reduce corrosion of the cylindrical container 6 of silencer box,

is shown in Figures 4 and 5. In this embodiment, the absorber 40 comprises a closed flexible bag-like container 22 which encloses a fibrous sound absorbent material 24 as described previously. However, in this case, a further  
5 layer 42 of flexible stainless steel foil is provided within the container and is arranged so as to abut inner surface 44 of the outer wall of the container 22. The stainless steel foil layer 42 extends along substantially the entire width and depth of the absorber 40 but is only  
10 provided in the lower half of the absorber.

It has been found that the stainless steel layer may be held in position simply by being sandwiched between the sound absorbent material 24 and the inner surface 44 of  
15 the outer wall of the container.

The absorber 40 is positioned within the container 6 so that the stainless steel layer 42 is disposed in the lower half of the container 6, as shown in Figure 5.  
20

The stainless steel layer 42 protects the lower surfaces of the cylindrical container 6 from the corrosive effects of acidic condensate and may, therefore, prolong the effective life of the silencer box.

25 Another embodiment which is designed to reduce corrosion of the cylindrical container of the silencer box, is shown in Figures 6 and 7. In this embodiment, the absorber 60 comprises a rigid semi-circular cross-section  
30 trough 62 made from stainless steel pressed foil. The trough includes inwardly facing longitudinally extending opposing lips 64. Sound absorbent material 24 is packed into the trough so as to fill it. The trough is then enclosed by shrinking a layer 66 of perforated plastics  
35 material around it.

Two absorbers are positioned around a pipe 8 of a silencer box as shown in Figure 7. (It should be noted that the cylindrical wall of the silencer box has been omitted from Figure 7 in the interests of clarity).

5

Whilst positioning the absorbers 60, diametrically extending parts of the plastics layers 66 and the adjacent sound absorbent material 24 is urged inwardly by the pipe 8. This ensures that the absorbers 60 are a frictional fit within the cylindrical container.

In each of the aforementioned embodiments, during use of the absorbers 20, 40, 60, the perforate plastics layer melts away as the silencer box heats up. However, even with the perforate plastics layers fully intact, each absorber is an effective silencer.

It should be appreciated that the absorbers 20, 40, 60 may be manufactured in various different shapes and sizes according to the dimensions of the particular silencer box for which they are intended.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly  
5 stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the  
10 foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any  
15 novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A sound absorber for a silencer box, the sound absorber comprising an absorber container which contains a sound absorbent material, wherein an outer wall of the container is of perforate construction.
2. A sound absorber according to Claim 1, wherein said container is arranged by means of its perforations to be penetrated in use by combustion gases.
3. A sound absorber according to Claim 1 or Claim 2, wherein the outer wall of the container includes a flexible outer wall part.
4. A sound absorber according to Claim 3, wherein the flexible wall part is of perforate construction.
5. A sound absorber according to any preceding claim, wherein the perforations of the absorber container have a diameter of greater than about 0.5 mm.
6. A sound absorber according to any preceding claim, wherein the open area of the perforate part of the container represents at least 8% of the total area of the perforate part.
7. A sound absorber according to any preceding claim, wherein substantially the entire outer wall of the absorber container is of perforate construction.
8. A sound absorber according to any preceding claim, wherein the outer wall of the absorber container is made of a plastics material, which is preferably flexible.

9. A sound absorber according to Claim 8, wherein the plastics material is arranged to be meltable, in use, as a silencer within which the absorber container may be arranged reaches its working temperature.
- 5
10. A sound absorber according to any preceding claim, wherein the sound absorber includes an anti-corrosion layer.
- 10
11. A sound absorber according to Claim 10, wherein the anti-corrosion layer is provided within the absorber container such that it abuts the inside surface of the outer wall of the container.
- 15
12. A sound absorber according to Claim 10 or Claim 11, wherein the anti-corrosion layer is made of a material that resists attack by acidic substances.
- 20
13. A sound absorber according to any of Claims 10 to 12, wherein the anti-corrosion layer comprises a metallic foil material.
- 25
14. A silencer box comprising a silencer container through which an exhaust pipe passes, a sound absorber being provided around the pipe, wherein the sound absorber comprises an absorber container containing a sound absorbent material, an outer wall of the absorber container being of perforate construction.
- 30
15. A silencer box according to Claim 14, wherein a perforate part of the outer wall of the sound absorber is disposed adjacent to the exhaust pipe.

16. A silencer box according to Claim 14 or Claim 15,  
wherein the perforate part of the outer wall of the  
sound absorber extends substantially around the  
entire circumference of the exhaust pipe, within the  
silencer container.  
5
17. A silencer box according to any of Claims 14 to 16,  
wherein the sound absorber includes an anti-corrosion  
layer, the anti-corrosion layer being provided  
adjacent to the outer wall of the silencer box.  
10
18. A sound absorber for a silencer box, the sound  
absorber comprising an absorber container which  
contains a sound absorbent material, wherein the  
sound absorber includes an anti-corrosion layer.  
15
19. A silencer box including a sound absorber according  
to Claim 18.
20. A sound absorber for a silencer box substantially as  
hereinbefore described with reference to the  
accompanying diagrammatic drawings.  
20
21. A silencer box substantially as hereinbefore  
described with reference to the accompanying  
diagrammatic drawings.  
25



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**Patents Act 1977**  
**Examiner's report to the Comptroller under**  
**Section 17 (The Search Report)**

Application number

GB 9212258.9

**Relevant Technical fields**

(i) UK Cl (Edition L ) F1B

(ii) Int Cl (Edition 5 ) F01N 1/24, 7/18

**Databases (see over)**

(i) UK Patent Office

(ii)

Search Examiner

R J DENNIS

Date of Search

29 JUNE 1993

Documents considered relevant following a search in respect of claims 1-17

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2231916 A (SOUND) see particularly paragraph bridging pages 2 & 3	1 and 8 at least
X	GB 2122256 A (A B BAHCO)	1 at least
X	GB 1593816 (FERROPLAST)	1, 3, 6 7, 8
X	GB 1341398 (SOUND)	1 & 5 at least
X	GB 0986377 (VERSIL)	1-4, 7-9, and 14-16
X	EP 0074220 A2 (LANCASTER) see particularly lines 31-35, page 5	1 & 14 at least



Category	Identity of document and relevant passages - 15 -	Relevant to claim(s)

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